CALCULUS.

325. **Proposed by E. B. ESCOTT, University of Michigan, Ann Arbor, Michigan.**

Integrate $\int \frac{4x^6 - a^3}{\sqrt{(x^6 - a^3)}}\, dx.$

326. **Proposed by C. N. SCHMALL, New York City.**

Prove $\int_0^\infty \frac{[(\tan^{-1}ax)^2 - (\tan^{-1}bx)^2]dx}{x} = \frac{1}{4}\pi^2 (\log a - \log b).$

327. **Proposed by RICHARD P. LOCHNER, 214 North 63rd Street, Philadelphia, Pennsylvania.**

A hound is at the middle point of the side of a square field, and a fox is at an adjacent corner. How far will the hound run to catch the fox if the fox runs on the perimeter of the field and the hound runs directly towards the fox at all times, the hound running n times as fast as the fox? Where will the race end?

328. **Proposed by M. E. GRABER, A. M., Heidelberg University, Tiffin, Ohio.**

Prove that, $\frac{E_m}{\pi/2m}\int_0^{\pi/2m} [\sin\alpha + \sin(\frac{\pi}{m}+\alpha) + \ldots \sin(\pi\frac{m-1}{m}+\alpha)]\, d\alpha = \frac{2m\,E_m}{\pi}$.

[Sheldon and Hausmann: *Dynamo Electric Machinery*, Vol. I, p. 51.]

MECHANICS.

269. **Proposed by F. H. SAFFORD, Ph. D., University of Pennsylvania.**

Three jointed rods, lengths 5, 2, and 5 units, are suspended from two pins which are 6 units apart and on a horizontal line, forming a freely jointed quadrilateral with the shortest side at the bottom. At the two lower joints are weights of A and $2A$, respectively. Find the position of rest, the reactions along each bar, and the pressures on the pins.

270. **Proposed by W. J. GREENSTREET, M. A., Editor, The Mathematical Gazette, Burghfield, England.**

A cycloid has its base vertical. Find the line of quickest descent from the middle point of the base, and its approximate inclination to the horizon.

NUMBER THEORY AND DIOPHANTINE ANALYSIS.

186. **Proposed by H. PRIME, Boston, Massachusetts.**

Show that $\frac{(n+1)(n+2)\ldots(2n-2)}{(n-1)!}$ is an integer for all values of n.